

## Abstracts of Technical Articles by Bell System Authors

*Automatic Ticketing of Telephone Calls.*<sup>1</sup> O. A. FRIEND. In January a new arrangement of dial central office equipment was placed in service at Culver City, California, designed to enable subscribers to dial for themselves their short-haul toll calls to other exchanges within the Los Angeles metropolitan area. These calls were formerly placed with an operator, who completed and timed the call and wrote a ticket used for billing. The new equipment controls the automatic completion of the dialed call, identifies the calling line, and prints a ticket showing the calling and called numbers and other information needed for billing. The arrangement applies to the step-by-step switching system and employs senders capable of routing these calls efficiently through a metropolitan trunking network. It affords operating economy together with faster and more convenient service.

*Noise Figures of Radio Receivers.*<sup>2</sup> H. T. FRIIS. A rigorous definition of the noise figure of radio receivers is given in this paper. The definition is not limited to high-gain receivers, but can be applied to four-terminal networks in general. An analysis is made of the relationship between the noise figure of the receiver as a whole and the noise figures of its components. Mismatch relations between the components of the receiver and methods of measurements of noise figures are discussed briefly.

*Structural Features of Buna S—Relation to Physical Properties.*<sup>3</sup> A. R. KEMP and W. G. STRAITIFF. The non-symmetry in the chain structure of Buna S hydrocarbon is discussed in relation to the prevention of crystallization and the impeding of cross linking during vulcanization. This lack of chain symmetry is put forward to account for the poor quality of Buna S vulcanizates in comparison with corresponding vulcanizates prepared from natural rubber. Fractionation data on a regular benzene-soluble crude Buna S indicates the presence of an objectionable broad range of polymer sizes. It is shown that the lowest-molecular-weight polymer fractions in Buna S are not chemically bound in the vulcanizate but remain soluble in chloroform. By removing most of this low polymer from Buna S, the chloroform extract of its vulcanizate decreases accordingly. Vulcanizates were prepared from high- and low-molecular-weight fractions of Buna S. The high fractions were tough, dry, and difficult to handle on the mill; the

<sup>1</sup> *Elec. Engg., Transactions Section*, March, 1944.

<sup>2</sup> *Proc. I. R. E.*, July, 1944.

<sup>3</sup> *Indus. & Engg. Chem.*, August, 1944.

lower-molecular-weight fractions were soft and sticky. The tensile strength of vulcanizates from the high fraction was somewhat greater than that of the whole polymer, but the modulus was considerably increased. For the low-molecular-weight polymer both tensile and modulus values were much lower. Vulcanizates prepared by mixing natural rubber and gutta-percha hydrocarbons show lower strength than either of the hydrocarbons separately tested in the same formula.